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V.I.

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
08/913,518	11/04/97	DEBALME J	1247-709-3VF

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EXAMINER	
AFTERGUT, J	
ART UNIT	**PAPER NUMBER**
1733	10

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary

Application No.	Applicant(s)
08/913,518	DEBALME ET AL
Examiner	**Group Art Unit**
Jeff Aftergut	1733

☒ Responsive to communication(s) filed on *Mar 19, 1999* .

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire *THREE* month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

Disposition of Claims

☒ Claim(s) *1 and 5-14* is/are pending in the application.

Of the above, claim(s) _____ is/are withdrawn from consideration.

☐ Claim(s) _____ is/are allowed.

☒ Claim(s) *1 and 5-14* is/are rejected.

☐ Claim(s) _____ is/are objected to.

☐ Claims _____ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on _____ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on _____ is ☐approved ☐disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. § 119

☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number) _____ .

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

*Certified copies not received: _____ .

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). _____

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 1 and 5-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Murphy (newly cited) in view of O'Connor, E.P. 408,898 (newly cited) and either one of Li et al (newly cited) or Koba et al (newly cited).

Murphy taught a process for forming a composite preform which included the steps of laminating a woven fiber reinforced ply to a nonwoven fiber reinforced layer wherein each of the layers would have included both thermoplastic filaments and reinforcing filaments. The thermoplastic filaments were melted in the lamination operation wherein heat and pressure were applied to the layers with heated pressure rollers. The reference taught that the composites would have included 2-25% thermoplastic in the plies. After the application of heat and compaction, the layers were cooled. The applicant is more specifically referred to column 5, lines 7-8 and column 6, lines 26-30 for a discussion of the use of woven or nonwoven layers in the stack. The reference taught the amounts of thermoplastic and/or reinforcing fibers in the composite preforms, see column 7, lines 51-column 8, line 22. The reference taught that heated pressure rollers would have been used to apply heat and pressure to laminate the plies together, see column 8, lines 44-49, column 9, lines 39-42. The reference taught that any number of woven and nonwoven layers could be assembled and bonded together with heat and pressure (followed by cooling) in

order to form the desired composite preform, see column 9, lines 1-18. The reference taught the inclusion of thermoplastic filaments within the weave and nonwoven layers (as well as the reinforcing filament therein), however the reference failed to express that the thermoplastic filament and the reinforcing filament would have been commingled and that the woven and/or nonwoven layers would have been formed from the commingled filaments of the thermoplastic and reinforcing filaments. The reference suggested that heated pressure rollers would have been useful for application of heat and pressure and seemed to infer that the operation of forming the preform would have been a continuous one (why would one use heated rollers to apply heat and pressure to a discrete stack of layers). The reference failed to suggest that the layers would have been disposed on a conveyor to convey the same to the heating and pressing operation.

However, as taught by O'Connor, one skilled in the art would have employed commingled filaments of thermoplastic and reinforcing filaments in order to ensure adequate contact between the thermoplastic and reinforcing filaments (and better wetting of the reinforcing filaments when heat and pressure was applied) to form woven and nonwoven laminates of reinforcing filaments and thermoplastic filaments. More specifically, O'Connor suggested that by commingling the thermoplastic filaments with the reinforcing filaments one was able to attain intimate contact between the thermoplastic fibers which form the matrix and the reinforcing fibers and a more even and uniform impregnation of the reinforcing filaments. The applicant is referred to column 1, lines 27-31, column 1, lines 45-57. The reference taught that commingling of the thermoplastic filaments and the reinforcing filaments would have been performed in the manufacture of both

nonwoven and woven fiber layers. The reference taught that in the formation of a nonwoven with the commingled yarns one would have chopped the same and deposited the short fibers together to form a mat or batt. The reference suggested that one would have desired intimate contact between the reinforcing filaments and the thermoplastic filaments and that one useful way for achieving the same would have been to commingle the filaments of thermoplastic and reinforcing materials together and utilize the same to either form a woven fabric or a nonwoven wherein subsequent to the formation one would have applied heat and pressure to the same in order to form a composite article. Because it would have ensured a better impregnation with the matrix, it would have been within the purview of the ordinary artisan to employ the mingling techniques of O'Connor in the process of Murphy. The combination, nonetheless, failed to suggest that the layers would have been disposed upon a conveyor.

However, in the art of laminating a woven layer to a nonwoven layer where one of the layers included thermoplastic filaments therein (and the thermoplastic was heated and melted to bond the layers together), it was known at the time the invention was made to employ a double band press to form the laminate as evidenced by E.P. '89[illegible]. More specifically, E.P. '89[illegible] suggested that one skilled in the art would have incorporated a double band press to form the laminate, see column 2, lines 35-37. Note that the reference to Murphy suggested that one would have employed a heated pressing roller to apply heat and pressure to the material to form the laminate. The reference to E.P. '89[illegible] suggested that those skilled in the art were well aware of the use of a conveying mechanism to feed the material which would have included a double belt press or a

calender system (a calender system would have been heated pressing rolls). The reference failed to depict the double belt press structure in terms of what the same would have entailed.

However, in the art of forming fiber reinforced thermoplastic composites, it was known at the time the invention was made to employ a double band press in order to convey as well as press a resin into the reinforcing fibers in the manufacture of a fiber reinforced thermoplastic composite article. Additionally, the use of a single endless belt where one employed pressing rollers to apply heat and pressure to the thermoplastic resin in order to enhance impregnation was also known as evidenced by either one of Koba et al or Li et al. More specifically, Koba et al employed bands 14 and 15 for conveying the reinforcing fibers and matrix material for impregnation where the matrix material employed was a thermoplastic material. The reference taught the use of heating rollers 17, 18, 19, 20, 22, and 23 (for example) for applying heat and pressure to the material in order to impregnate the reinforcing filaments with the thermoplastic matrix. The reference additionally included a cooling section 26 which is more clearly depicted in Figure 7 which also included pressing chilled rollers which were used to solidify the matrix material once the same was impregnated into the fibers. The reference clearly suggested to one skilled in the art that when heated pressing rollers were used to impregnate a thermoplastic matrix material into reinforcing fibers one would have utilized a conveyor onto which the reinforcing material was disposed (in this case the double band belts. Regarding the reference to Li et al. The reference suggested that one would have utilized an endless conveyor onto which the reinforcing material with the matrix material would have been disposed. The reference taught plural heating

pressing rollers 53 and 54 as well as plural pressing and cooled rollers 56 and 57 which were used in the manufacture in order to press the matrix of thermoplastic resin evenly into the fibers of the prepreg material. The reference taught the use of an endless conveyor 30 for feeding the material through the heating and cooling operations. Certainly, such would have been useful in the operation of Murphy where the use of pressure applying rollers (which were heated) was suggested for application of heat and pressure to flow the thermoplastic fibers in the nonwoven and woven layers in order to bond the two together. This is particularly true in light of the teachings of E.P. '896 because the use of a double band press or calendering operation was suggested as useful for the application of heat and pressure when working with such "dry" fabric materials. It would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize the conveyor and heat and pressure application means of either one of Koba et al or Li et al in the manufacture of a fiber reinforced thermoplastic resin impregnated composite which was made up of plural dry fabric layers (whether woven or nonwoven) as such was suggested as having been useful with such "dry" fabrics for melting the matrix therein as suggested by E.P. '896 and because the use of heated pressing rollers was suggested by Murphy himself wherein the nonwoven and woven fabrics would have been formed from commingled fibers in order to achieve intimate contact between the matrix material and the reinforcement as suggested by O'Connor.

With regard to claim 5, note that the reference to Murphy suggested the use of nonwovens in the form of mats or batts and that the reference to O'Connor suggested that the fibers were

chopped when making a nonwoven. Note that a fabric (as claimed) is not made of chopped fibers (and as discussed the claim is unclear and confusing because only the nonwoven was formed of the chopped fibers). Regarding claim 6, note that the weaves of Murphy and O'Connor were formed of continuous length filaments and that such would have included commingled filaments only (for more intimate contact). Again note that the claim is unclear because it is not certain that the nonwoven of claim 1 was made from continuous length filaments. In any event nonwoven mats formed from continuous filaments were conventional in the art and such would certainly have been within the purview of the ordinary artisan in light of the teachings of Murphy. Regarding claim 7, note that Murphy suggested the application of heat and pressure to consolidate the layers followed by cooling of the same as did O'Connor. Regarding claims 8-10, as previously noted in paper no. 7, the particular number of layers and the order in which they were stacked would have been within the purview of the ordinary artisan depending upon the desired thickness and strengths of the final composite article. Note that Murphy suggested that the number of layers would have been left up to those skilled in the art and that different layers would have been provided with different amounts of thermoplastic in order to achieve none but the expected results. Regarding claim 11, note that in Murphy as depicted the layers appear to have the same width. Regarding claim 12, note that Murphy suggested the specified amount of reinforcement in the composite article. Regarding claim 13, note that the reference to O'Connor suggested the use of a chopping means and that as set out in paper no. 7, one skilled in the art would have understood that a spool would have been used to supply a fabric of material and such

is taken as conventional in the art. Note that the reference to Koba et al suggested that one would have utilized a double band press. The use of a double band press was additionally taught by E.P. '89$\mathcal{E}$. The applicant is additionally advised that one skilled in the art would have understood that a preheater would have been utilized in combination with a double band press and such is taken as conventional in the art. Regarding claim 14, see the comments regarding claim 13 and note that Murphy suggested the formation of multiple layers and such would certainly have included multiple supply devices. Regarding both claims 13 and 14, the use of a guillotine to cut the material downstream of the press would have been obvious as such would have been used to provide composite material of a suitable size and the use of the same is taken as conventional in the art.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 5 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear how a fabric can be formed completely from chopped commingled fibers (a fabric usually has continuous fibers therein with a warp and a weft), see claim 5. It is suggested

that applicant recite that a nonwoven was formed with was made up of chopped commingled threads. Regarding claim 6, as noted above, typically nonwoven fabrics are not formed from continuous filaments and it is therefore suggested that applicant recite that the fabric is formed exclusively of the continuous commingled threads.

Response to Arguments

5. Applicant's arguments with respect to claims 1 and 5-14 have been considered but are moot in view of the new ground(s) of rejection.

The applicant argues that none of the references suggested the formation of plural continuous layers which were fed to a laminating device where such layers included a fabric strip as well as a layer of nonwoven (or a layer of commingled fibers which were not woven into a fabric). However the reference to Murphy suggested the same. The reference additionally suggested that one would have continuously processed the material with heated pressing rollers (rather than cutting the same to form discrete plies which were then laid in a mold for the application of heat and pressure). The applicant is advised that one skilled in the art would have understood that the heated pressing rolls of Murphy would have included the structures of Koba et al or Li et al (which both taught heated pressing rollers for application of heat and pressure to a thermoplastic matrix material in the formation of a composite) particularly in light of the suggestion of E.P. '896 that such would have been useful for joining plies of woven and nonwoven fibers of thermoplastic and reinforcing filaments. The applicant is advised that such

devices would have included a conveyor which supported the material through the heating and pressing operation and such would have included an endless belt type conveyor. The use of a conveyor to feed a fabric and a nonwoven through a laminating zone where heat and pressure were applied to consolidate the same and infiltrate the reinforcing filaments with the thermoplastic resin was therefore believed to have been suggested by the newly cited references and applicant is not believed to be entitled to a patent of the same.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jeff Aftergut whose telephone number is (703) 308-2069.

JHA
April 29, 1999

JEFF AFTERGUT
PRIMARY EXAMINER
ART UNIT 1733